



WP PWIE

SP B / Experiments on erosion, deposition and material migration
SP B.1 Physics of erosion and deposition

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W and Be dust produced in off-normal (air and water leaks) conditions in fusion reactors



Tasks to be performed:

- **Investigate the formation and properties of W and Be dust produced in off-normal (air and water leaks) conditions in fusion reactors (IAP)**

Deliverables:

- **D5: Size distribution and composition of Be and W dust formed during air and water leaks (IAP)**

Be dust generation

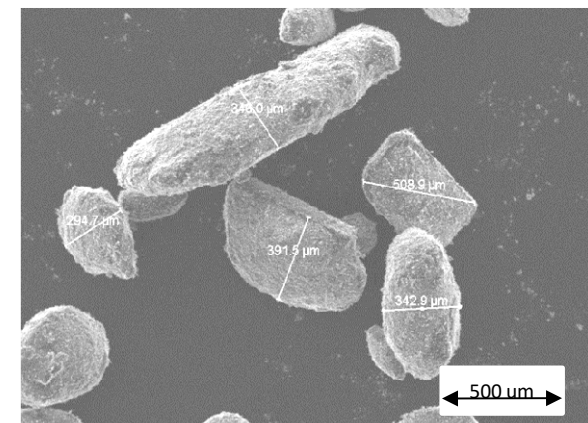


Be dust produced in off-normal (air and water leaks) conditions in fusion reactors

- **Apparatus:** a Retsch milling machine using alumina grinding media ball and a Al_2O_3 ball mill of 500 cm³ volume
- **Operating parameters:** 200-500 rpm speed, 30-90 hours operation time.
- **Milling environment:**
 - air at room temperature,
 - distilled water
- **Expected dust sizes:** i. $>160 \mu\text{m}$, ii. 90-160 μm , iii: $<36 \mu\text{m}$.



Alumina balls to be used for ball milling



Example of the Be dust particles size

Be dust characterization



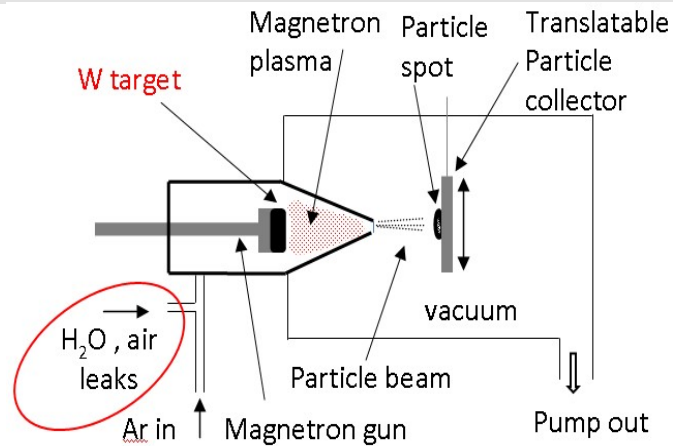
Analysis capabilities:

Particle size and morphology of the produced dust will be analyzed using a SEM (Scanning Electron Microscopy) technique using a FEI Co. Model Inspect microscope.

Oxygen content of the dust after the milling will be determined using EDS (Energy Dispersive Spectroscopy) using a FEI Co. Model Inspect apparatus

Thermal outgassed compound content (O, H₂O, BeO, Be₃N₂, Be(OH)₂) of the dust, using calibrated Thermal Desorption Spectrometry (TDS).

W dust generation



Schematic of the MSGA source in presence of air /water leaks

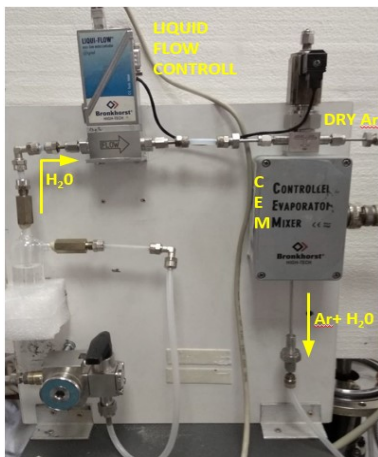
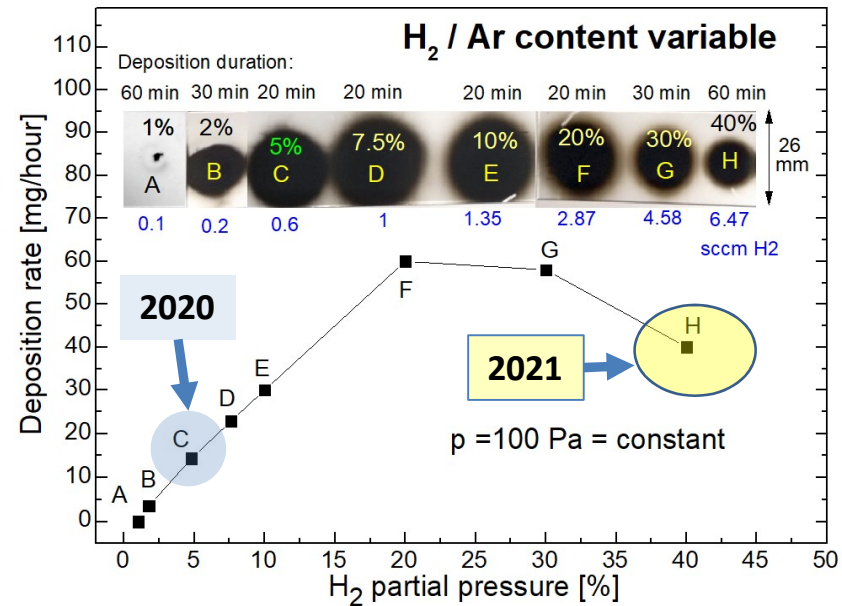


Image of the CEM setup for Ar humidification.

Influence of the H₂ over the W NPs deposition rate (2020)



2020: Ar dominant in the discharge (point C, 5% H₂)

2021: H₂ content will be increased in MSGA (> 40%)

W dust characterization:

- Weighting (synthesis rate);
- SEM (morphology, size distribution);
- EDX and XPS (chemical composition).